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ABSTRACT

Contemporary theories of perceptual-motor development and dysfunction are analyzed in detail in this review of the literature. Studies focused on observation of delays, deviations, cause, theories of development, and programs of remediation. It is suggested that it may be presumptuous for theorists to delineate three, four, or ten characteristics that a child must display to demonstrate perceptual-motor dysfunction. Among theorists, there has been increasing agreement and repetition of findings that a child with perceptual-motor dysfunction has difficulty in the reception, integration, or response of stimuli, or a combination of these. Clumsiness, inability to attend to a task or screen inappropriate stimuli, hyperactivity, poor body image, visual disturbances, and poor bilateral integration are some of the more generalized and frequently mentioned characteristics. It is suggested the study of the effect of motor development on other variables could be more productive if normal and abnormal development were better understood. (CS)

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CONTEMPORARY THEORIES OF PERCEPTUAL-MOTOR DEVELOPMENT

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The literature describes the child with perceptual motor dysfunction as one who is having difficulty adjusting to his environment (6,24,26,44, 69,72). He responds as best he can under conditions of inaccurate interpretation of stimuli and motor response. Typically he is a clumsy, distractible child, and often displays a high degree of skeletal movement. He may become easily frustrated and lack confidence. Frostig, in a study of 2,000 public school children, concluded that a child's perceptual development was an indicator of the child's overall developmental status, and that such children are often chided and pressured by parents and teachers for clumsiness, poor writing and reading (52). They show frustration from repeated failures, and are often improperly diagnosed as behavioral or emotional problems (49).

Many of the developmental signs discussed under the relatively new title of "perceptual-motor" are not revelations, but have been discussed for centuries as isolated and independent components of child development (92). Hobbes, Locke, and Hume recognized the value of sensory experience as early as the seventeen hundreds (92). There was, at that time, a

developmental theory which proposed the failure of one hemisphere of the brain to establish dominance over the other demonstrated a need for increased motor activity (92). Delacato utilizes physical movement, passive patterning, and sensory stimulation to establish hemispheric dominance, which he indicates should be complete by six years of age (43,44). More recently Piaget has directed attention to motor and sensory experiences as the foundation of perceptual development which is necessary for abstract reasoning (61,82).

Movement Perception and Thought, Movement and the Intellect, Perceptual Training in the Classroom, and Steps to Achievement for the Slow Learner, are just a few titles that support the observation that motor development is being related to other areas of development (34,32, 48). A body of literature suggests that a relationship exists between academic learning and visual motor perception (59), coordination, balance, directionality, body image and other motor developmental variables (40, 60,61,78,98,102). Many programs promote movement experiences as a panacea to improve perceptual abilities, and cognitive functioning (5,8, 13,19,26,27,32,34,37,43,44,47,49,61,71). Many claims, intervention programs, and methods of identification will be presented in the theories reviewed by these writers, and we will attempt to present studies with each theory that support or deny the theorist's position.

Kephart has structured a theory from previously isolated ideas of Gesell, Sherrington, Piaget, Hebb, and Strauss (85). Kephart outlines progressive stages that he believes are necessary for the child to interpret his environment, respond to it, and proceed to satisfactory academic functioning (26,58).

He (26) states the first learnings experienced by a child are motor learnings. This is reflected in the gross thrashing arm and leg movements of a newborn child. Much of this early motor activity is in the form of reflexes to stimuli in the environment (27). The next stage involves the child's constant adjustment of static and dynamic postures to the effects of gravity (47). A reference point from which the child begins to establish spatial organization is possible following the awareness and control of the center of gravity. The child is then capable of locomotion (not necessarily upright locomotion). As a result of constant interchange of varied postures, general movement patterns evolve (26). Movement patterns facilitate exploration, or the purposeful gathering, and storing of masses of information, which includes perceptual manipulations, or the contact phase (69). A child receives tactile information while manipulating; with his hands he feels the corners, lines, and texture of forms (58). At this time perceptual and motor data are combined into a meaningful whole Kephart t rms a "perceptual-motor match" (69). Comparing similarities and differences, for example chair = wood, metal = hard, feathers = soft, leads to greater association and concept formation (27). Receipt and propulsion is a phase that provides a relationship between moving objects and static objects and to movement toward and away from the child (58). Rhythm and the temporal stage includes the ability to control movement in a flow of recurring actions at regular intervals and an awareness of time in between intervals of repetition (47).

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Kephart differentiates between general motor patterns and motor skills and stresses the importance of the child developing both patterns and skills. He describes a motor skill as limited movement but accuracy stressed, contrasted from a motor pattern which is movement stressed but accuracy limited (58). It is through the experience of general motor patterns that the child develops a "body schema" -- that is, an awareness of what and where body parts are and the space they occupy. Kephart refers to the end result of these generalized motor experiences as the development of a "motor base" (48). It is with the development of the "motor base" that the child is able to attend to the information available through movement and not be preoccupied with how to move (27,50).

If pressure is placed on the child to respond specifically to a stimulus in an expected manner, a specific skill is developed to satisfy that particular demand imposed on the child. This, Kephart refers to as a "splinter skill," and it can hinder the exploration phase by requiring the child's concentration be held on the mechanics of how to explore rather than on the purpose and objectives of exploration which are information gathering (58).

Kephart proposes that spatial organization of a child is facilitated by lateral usage, preference and awareness of right and left (48). Keogh (68) performed a study entitled "Preschool Children's Performance on Measures of Spatial Organization, Lateral Perference, and Lateral Usage." Children in the study were between four and six years of age including 44 boys and 35 girls. The lateral preference inventory included observing the child kick a ball, throw a ball, look through a kaleidoscope and

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lateral awareness which included questions on right and left relationships of three objects in varied positions, such as "is the penny right or left of the pencil?" Spatial organization items included copying ten geometric shapes, draw a person, and pattern walking, and geometric shapes which were scored on a scale from one to four. The study showed no significant relationship between lateral usage, lateral awareness and performance on spatial organization tasks. The degree of lateralization functioning did not distinguish the sample on spatial organization measures.

Morris briefly mentions evaluative studies conducted on Kephart's remediation program (80). Haring and Stables, 1966, noted significant improvement (.01) of educable retardates on visual perception and eye hand coordination after a Kephart motor training program. Rutherford (1964) compared two groups of normal kindergarten children on the Metropolitan Readiness test after eleven weeks of free play by the control group, and Kephart-oriented activities by the experimental group. The experimental group demonstrated significant improvement (.01) over the free play group. No mention was made, however, of "Hawthorne effect" or of specific activities utilized. Morris (80) relates another study by O'Connor, 1969, in which a traditional physical education program and Kephart program were carried out for six months. The Kephart group performed better (.05) on three-quarters of the motor ability items, with the exception of grip strength. There were, however, no significant differences on the Metropolitan Achievement and Readiness tests which contradicts Kephart's argument that perceptual-motor activities prepare

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a child for improved academic performance. Morris (80) notes a discrepancy in Kephart supporting generalization of learning yet recommends a program of "specific" skills for the slow learner.

Bryant Cratty criticizes Kephart's lack of neurological background for his theory and the inaccuracy of what neurological information Kephart does provide (36). Cratty is referring to Kephart's mention of the cerebellum as controlling balance and the malfunctioning of a neuron in that area affecting all other neurons, including short circuiting thoughts from the cortex. Cratty emphasizes that the motor cortex and occipital areas also contribute to balance and the misfiring of one neuron to cause large numbers to misfire is unsupported by any evidence. Cratty states that Kephart's theory on the quality of early motor abilities being predictive and influential of later intelligence are not in agreement with research. Cratty fails to indicate the research to substantiate his criticism.

Cratty (34) seems to relate and concern his efforts more directly to problems children repeatedly encounter in the learning process in the classroom. He is more concerned with outward behaviors and non-adjustments of children than Kephart. He relates movement activities directly to the education process of the following reasons (34):

(1) A child can act out the thought process.

(2) Physical activities elicit simple responses to large vivid stimuli.

(3) The activities are fun and motivating.

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(4) Total body movement will reach those children not reached by traditional methods.

(5) Motor tasks involve integration of movement and visual cues rather than depending on one sensory input.

(6) They involve the here and now, and are not subtle.

Although the reasons sound logical, Cratty admits that those activities and others are based upon unsubstantiated hypotheses rather than completed research (34). Cratty proposes three stages of perceptual-motor development. The first level he describes is composed of behavioral supports, aspiration level, arousal and ability to analyze a task. The second stage is composed of perceptual-motor factors, and the third is factors specific to the task or situation, which includes social characteristics, force, and energy.

An investigation by Cratty of 50 subjects ages five through 19 classified as educationally handicapped demonstrated marked deficiencies in hand-eye, body-eye, foot-eye coordination, and an inability to make left/right discriminations about their body (35). Cratty compared his findings to Ayres' factor analysis study of 50 neurologically impaired and 50 normals in which she identified six major areas of dysfunction. Ayres' areas of dysfunction were: (1) Body-hand image, (2) Lack of awareness of form and space, (3) Hyperactivity, distractability, (4) Integration of two sides of body, (5) Figure ground discrimination, and (6) Balance with the eyes open and closed. A program recommended by

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Cratty for these problems includes body-hand image, locomotor abilities, visual motor integration of hand-eye, body-eye, foot-eye, and static and dynamic balance activities (35). In order to prolong attention Cratty prescribes absorbing activities such as balancing on a wooden rocker (80). Cratty has adopted methods from Jacobson on relaxation (80). Cratty and Kephart both recommend whole body coordination activities, and they agree on the minimal value of physical fitness, strength, flexibility or cardiovascular training (80).

Ayres bases her theories and conclusions from actual comparison studies of normal and children with suspected perceptual deficits (6). She approaches and relates functioning at a lower level and utilizes a more scientific model of stimulus, process and response in light of the functioning of the nervous system (7,8). Ayres proceeds to analyze a child's reactions to his environment by studying the reception, integration, and response of a stimulus in relation to the systems that intervene in that process. Ayres in a statement concerning perceptual-motor function, related, "In order to respond to the environment, one must first be able to interpret it" (8). Before the stimuli can be interpreted they must be received, and sensory receptors such as touch, proprioceptors, vestibular system and vision perform that function (8). Meaning is then attributed to the stimulus received and a motor act ensues which also serves as feedback information to the central nervous system on the accuracy of the response (8).

Ayres explains the importance of the tactile system and its crucial role in hindering or facilitating the interpretation, integration of

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incoming stimuli by controlling cortical stimulation (4). She describes the tactile system as being composed of the primitive protective system, which interprets stimuli as dangerous and initiates action and movement to protect the organism, and the discriminative system which permits interpretation, and discriminatory functions of temporal and spatial stimuli (4). The Reticular Activating system is responsible for integrating stimuli; however, if the protective system dominates by sending more messages than the discriminatory system, the organism fails to respond effectively to the tactile environment. The result of a dominant protective system is increased skeletal movement, verbosity, and response to non-purposeful stimuli. Ayres refers to a child with such characteristics as "tactile defensive" (4). She indicates that motor planning is threatened by a dominant protective system, and recommends brushing activities to inhibit the protective and stimulate the discriminatory system (2,4). Ayres suggests motor planning is necessary to all motor acts that aren't reflexes and it conditions the central nervous system for more complex movements (8).

Using 100 children with and 50 children without suspected perceptual deficits, Ayres conducted a large study designed to discover relationships that would provide a theoretical structure of the nature of perceptual-motor dysfunction. Ayres related a number of studies which described isolated perceptual deficits. Benton concluded finger agnosia and right left disorientation occur together (22,23). Benton later found unconvincing correlations between elements of the "Gerstman Syndrome," finger localization, writing, calculating, and right-left orientation (6).

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Frostig (79) in 1963 compared scores on her visual perception test to the child's overall developmental status and suggested perceptual development was a key indicator. Delacato proposed significance of mixed eye hand dominance, and right-left hemisphere dominance in perceptual and motor functions (43,44). Ayres writes, "It appears that the next most logical step to be taken in the development of knowledge of perceptual-motor dysfunctions is the investigation of possible patterns of perceptual-motor function and dysfunction and the relative independence of their manifestation" (6).

The dysfunction group in Ayres' study demonstrated difficulty in reading, writing, or arithmetic, and was classified as clumsy, hyperactive, and distractible. Their mean age was seven years. The control group matched the dysfunction group on mean age, mental age range, and sex. The following areas of function were evaluated: eye-hand coordination, graphic skills, visual perception, kinesthetic perception, tactile functions, ocular control, finger identification, standing balance one leg, gross and fine motor planning, right left discrimination, unilateral hand dominance, agreement between eye-hand dominance, crossing the midline, time and rhythm, number concepts, tactile defensive behavior, and hyperactive distractible behavior (6).

Five major patterns of perceptual-motor dysfunction identified were:

1. Developmental apraxia. A strong relationship was found between motor planning and tactile functions, and eye pursuit and motor planning.

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2. Form constancy and spatial relations including tactile, kinesthetic and visual perception correlated.
3. Hyperactive and distractible behavior significantly correlated with tactile perception.
4. Deficit of integration of two sides of the body was demonstrated by failure of the child to discriminate between left and right sides of the body.
5. Visual ground discrimination was represented by the inability to identify superimposed figures.

Laterality variables were not significant in the factor analyses and this study suggests no relationship of handedness, degree of homologous eye-hand dominance and perceptual-motor functions. Ayres concluded that the syndromes could not be categorized around specific sensory modalities, but rather were characterized by the coordination of intersensory and motor information to permit the development of perceptual-motor ability (6).

It is the opinion of these writers that Ayres has taken a more scientific approach, completed more research, and related her findings more directly to any writings or theories than any of the other perceptual-motor theorists. The study just reported on has provided a great deal of information on a large number of isolated characteristics, and perceptual-motor variables. The need for such future efforts is of greater importance than non-researched theories. Ayres critiques her own findings,

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"Attention is called to the fact that this structure is considered provisional and will need to be modified as additional scientific data become available" (6).

The Marianne Frostig Developmental Test of Visual Perception was constructed to assess sub-areas of perception important for school performance (54). Frostig, like Piaget, believes perception is the most important developmental task between three and seven and one-half years. Frostig believes in the importance of sensory motor development and includes in her program gross and fine motor coordination, eye tracking, and enhancing of body image (54). Frostig does not support pure movement remediation. She feels it leads to a neglect of other educational goals. Like Kephart and Cratty she recommends large movements prior to developing fine motor movements. Not in contrast to Ayres, she recommends tactile and kinesthetic stimulation linked with visual motor training. Some of Frostig's program activities include matching different colored geometric shapes, directions in relation to own body, and mirror image activities (80). Eye movement exercises are for the purpose of attempting to develop the child's ability to control his eye movements in focusing and following objects (80).

Barsch (16) feels that the term "perceptual disturbance" must be specific, because the failure of a child in one task doesn't necessarily generalize to others. A child could be unable to close all the lines on a diamond, but use a fork and not be clumsy. Barsch (16) expresses similar views as Kephart on movement and learning, balance and self-identity, zero point of reference, and subsequent understanding of left,

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right, vertical, and horizontal directions. Barsch believes a body image develops, however, he points out how it affects other areas is not known, and sometimes the image is not well developed as is evident by adults who have difficulty locating physical symptom locations on their bodies for doctors. He terms his theory of movement "movigenics" and he describes the human mechanism for transducing energy forms into information as the "percepto-cognitive system."

Carl Delacato's (43) theory is based on neurological organization and the establishment of a dominant hemisphere of the brain by age six. Following the development of a dominant hemisphere are hand, eye, and foot dominance. Delacato is concerned with first finding the level of neurological organization of the child. According to Delacato if a child's head is turned while he is asleep,he should resist the turning of the head and return to his original position after it is turned. Delacato proposes that a greater neurological organization exists if the child can accomplish the task while asleep. If the child does not change position after his head is turned, a lower level of neurological organization exists. Another diagnostic measure Delacato uses is observation of the child's floor activity. Creeping by flexing and extending the arms and legs in alternation is the first level of locomotion. This is followed by homolateral crawling or movement of the arm and leg on the same side of the body. The head is turned to the flexed arm and leg. Cross pattern crawling requires the same movement of the arm and leg on opposite sides of the body and the head turns toward the flexed arm and extended leg. Delacato's program for non-walking children includes

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spending most of their time on the floor in the prone position and being encouraged to crawl or creep. In addition, a passive patterning program is recommended. Either the homolateral or cross pattern movements are applied to the child passively. It requires three people; one to move the head, one to move the left arm and leg, and one to move the right arm and leg. Delacato suggests that breast feeding facilitates the neurological organization of the child because of the alternated positions and gazes of left eye, left hand and right eye, right hand, whereas a bottle fed baby is usually positioned with the right hand trapped against the mother and the right eye occluded. Delacato suggests that binocularity is encouraged by letting the child eat with his hands past the age of nine months. Delacato's theory of neurological facilitation is based on the premise that if a portion of the brain is injured or not functioning the uninjured portion is used and trained through the patterning procedures previously described (43).

In 1958, Delacato treated children with diagnoses of spasticity, (cerebral lesion), athetoid, (midbrain region), tremor and rigid, (basal ganglia), and ataxic, (cerebellar lesions). Sixteen were zero to thirty-six months, forty-one from eighteen to thirty-six months and nineteen over thirty-six months in age. The program consisted of prone position crawling, creeping, and passive patterning, five minute sessions, four times daily, seven days a week using three adults for each child. Sensory stimulation of hot and cold brushing, and a breathing program were also utilized. The mean duration of the treatment was for eleven months. Delacato indicates that twenty children were unable to move at the

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beginning of the program and seventeen unable to walk. At the conclusion of the study he reports eleven were walking independently, twelve were ready to walk and eight were cross pattern creeping (43). There were seventy-six children in the study and Delacato referenced the progress of thirty-one of the thirty-seven unable to move or walk. The progress of the other fifty-five children was not reported. It is also unclear what "ready to walk" actually says about the development of the child. Delacato reported an overall improvement of four and one-tenth levels but it was unclear as to what "levels" were. Delacato's theory has not been proven nor has his theory of brain function been researched by neurologists (61). Rabinovitch denounces creeping and crawling as regressive and may bring about emotional disturbance. Seven major medical and health organizations have termed his theory "without merit." The American Academy of Pediatrics has described Delacato's methods as disrupting to family life (36).

Summary

When considering perceptual-motor development there has been a tremendous amount of work accomplished in the form of observation of delays, deviations, cause, theories of development, programs for remediation, and which theories or parts of theories are valid or invalid. There are supporters and dissenters for all of the theories. Many of the ideas of the theorists are supported by related studies, and at the same time denied by other studies. If any one theory was sound from the first premise to the last, and if that theorist actually possessed such insight, he (she) would be experiencing a much greater

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impact than is presently the case. Theorists have followed their own light depending on their background, training, interests and knowledge of and communication with findings of their colleagues.

Irregardless of differences there has been overlap, agreement and repetition of findings among theorists, and researchers. There is agreement that a child with perceptual-motor dysfunction has difficulty in either the reception, integration or response of stimuli or combination thereof. Clumsiness, inability to attend to a task or screen inappropriate stimuli, hyperactivity, poor body image, visual dist bances, and poor bilateral integration, are some of the more generalized and frequently mentioned characteristics (4,8,27,47,49,52,85,86). The list grows beyond that to problems in figure ground, tactile, haptic perception, form constancy, directionality, laterality, spatial relationships, graphesthesia and ad infinitum. These variables have been studied independently, in relationship to reading, I.Q., readiness, classroom achievement, and adjustment, and normal motor development.

What are the priorities in the consideration of perceptual-motor development? Is it the visual process, the tactile and kinesthetic function, generalizing motor patterns, or considering the development of eye, hand, and foot dominance? There are thousands of variables to consider, and the task so enormous and complex that it is difficult to piece together "the theory" or perceptual-motor function or dysfunction. Repeated intercorrelations of isolated variables and perceptual motor test items by different investigators point to the elusiveness of developing a rationale. Ayres (6) conducted an extensive intercorrelation study and

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one of her conclusions was that many of the variables could not be categorized around specific sensory modalities. This seemed to be a common finding supported by other investigations including Cruickshank who indicated that perceptual disturbances resulting from brain damage were not necessarily general (52), low intercorrelations on Frostig's subtests (30), and the Purdue Perceptual Motor Survey (85).

It may be presumptuous for theorists to delineate three, or four or ten characteristics that a child must display to demonstrate perceptual-motor dysfunction. Children are complex biochemical organisms and are individuals, all displaying specific problems, reactions, developmental patterns. Generalized theories and statements such as "perception is the most important developmental task between three and seven," are profuse in the literature. Probably many would argue that perception is important but the statement does not tell us much about the process (54). Theorists need to become less isolated, and pool their efforts, ideas, and talents together. The medical professionals could greatly assist educators in researching theories that have been broken down to objective tasks.

Motor development is being related to other areas as was previously mentioned, however, the study of its affect on other variables could be more productive if normal and abnormal development were better understood. Many of the studies are being conducted with school age children, however, it would seem valuable to review the processes of development during the first five years of life also.

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BIBLIOGRAPHY

1. Ayres, A. Jean. "The Visual-Motor Function," American Journal of Occupational Therapy. 12:1958, pp. 130-138.

2. Ayres, A. Jean. "Perceptual Motor Dysfunction in Children," Monograph from Ohio Occupational Therapy Association Conference, 1939 Shenandoah Avenue, Cincinnati, Ohio.

3. Ayres, A. Jean. "Perceptual-Motor Dysfunction," Corrective Journal of Occupational Therapy. January 1964.

4. Ayres, A. Jean. "Tactile Functions - Their Relation to Hyperactive and Perceptual Motor Behavior," American Journal of Occupational Therapy. 18:January, February 1964, p. 6.

5. Ayres, A. Jean. "Sensory Integrative Processes and Neuropsychological Learning Disabilities," Learning Disorders. 3:Seattle: Special Child Publications, 1965, p. 42.

6. Ayres, A. Jean. "Patterns of Perceptual Motor Dysfunction in Children," Perceptual Motor Skills. 20:April 1965, p. 335.

7. Ayres, A. Jean. "Interrelationships Among Perceptual-Motor Functions in Children," American Journal of Occupational Therapy. 20: March-April 1966, p. 68.

8. Ayres, A. Jean. "Interrelation of Perception, Function, and Treatment," Physical Therapy. 46:1966, pp. 741-744.

9. Ayres, A. Jean. The Ayres Space Test. Western Psychological Services, Box 775, Beverly Hills, California. February 1968, pp. 1, 2, 3, 11, 17, 18, 19.

10. Ayres, A. Jean. Southern California Figure-Ground Visual Perception Test. Western Psychological Services, Box 775, Beverly Hills, California. October 1968.

11. Ayres, A. Jean. Southern California Motor Accuracy Test. Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, California, November 1968. pp. 1, 8, 9, 10, 11, 19.

12. Ayres, A. Jean. Southern California Perceptual-Motor Test. Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, California, 1968, pp. 1, 7, 9, 10, 11, 12.

13. Ayres, A. Jean. Southern California Kinesthesia and Tactile Perception Tests. Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, California, February 1969.

BEST COPY AVAILABLE

14. Ayres, A. Jean. "Characteristics of Types of Sensory Integrative Dysfunction," The American Journal of Occupational Therapy. 25:1971, pp. 329-334.

15. Bachman, John C. "Motor Learning and Performance as Related to Age and Sex in Two Measures of Balance Coordination," Research Quarterly. 32:1961, pp. 123-137.

16. Barsch, Ray H. "Achieving Perceptual Motor Efficiency," Seattle: Special Child Publications, 1968, pp. 18, 19, 20, 33, 40, 76, 105, 113, 116, 119, 133, 135, 149, 153, 157, 158, 170, 207, 208, 219, 224, 321.

17. Beardslee, Davis C. and Wertheimer, Michael. Readings in Perception. D. Van Nostrand Company, Inc., 1958, pp. 133, 137, 194, 199, 202, 412, 418.

18. Beckman, Sherry M. "Application of Treatment Principles," as cited in Perceptual Motor Dysfunction, Evaluation and Training, Occupational Therapy Seminar, Madison, Wisconsin, June 1966, p. 121.

19. Bell, Virginia Lee. Sensorimotor Learning. Goodyear Publishing Company, Inc., Pacific Palisades, California 90272, 1970.

20. Belmont, Lillian and Birch, Herbert G. "Lateral Dominance and Right-Left Awareness in Normal Children," Child Development. 34:1963, pp. 257-270.

21. Belmont, Lillian and Birch, Herbert G. "Lateral Dominance, Lateral Awareness and Reading Disability," Child Development. 36:1965, pp. 57-71.

22. Benton, Arthur L. and Menefee, Frances L. "Handedness and Right-Left Discrimination," Child Development. 28:(2) 1957, pp. 237-242.

23. Benton, Arthur L. "Right-Left Discrimination and Finger Localization," Copyright 1959, Hoeber-Harper.

24. Braley, William T., Konick, Geraldine, and Leedy, Catherine. Daily Sensorimotor Training Activities. Peek Publications, 4067 Transport Street, Palo Alto, California.

25. Carpenter, A. "The Measurement of General Motor Capacity and General Motor Ability in the First Three Grades," Research Quarterly, 13:(4) 1942, pp. 444-465.

26. Chalfant, James C. and Scheffelin, Margaret A. "Visual Processing," as cited in Central Processing Dysfunctions in Children, pp. 28, 29, 31, 33.

BEST COPY AVAILABLE

27. Chaney, Clara M. and Kephart, Newell C. Motoric Aids to Perceptual Training. Charles E. Merrill Publishing Company, Columbus, Ohio, 1968.

28. Chissom, Brad S. and Thomas, Jerry R. "Comparison of Factor Structures for the Frostig Developmental Test of Visual Perception," Perceptual and Motor Skills. 33:December 1971, pp. 1015-1019.

29. Choban, G. M. "Effects of Visual Distortions on Motor Execution as Measured in a Drawing Test," Perceptual and Motor Skills. 24:1967, pp. 455-464.

30. Corah, Norman L. and Powell, Barbara J. "A Factor Analytic Study of the Frostig Developmental Test of Visual Perception," Perceptual and Motor Skills. 16:1963, pp. 59-63.

31. Cratty, Bryant J. Movement Behavior and Motor Learning. Lea and Febiger, Philadelphia, 1964.

32. Cratty, Bryant J. "Movement and the Intellect," Learning Disorders. 3:Seattle: Special Child Publications, 1965, p. 525.

33. Cratty, Bryant J. Motor Activity and the Education of Retardates. Lea and Febiger, Philadelphia, 1969, pp. 26-41.

34. Cratty, Bryant J. Movement Perception and Thought. Peek Publications, 4067 Transport Street, Palo Alto, California 94303, 1969.

35. Cratty, Bryant J. Perceptual Motor Behavior and Educational Processes. Charles C. Thomas Publisher, Springfield, Illinois, 1969.

36. Cratty, Bryant J. Perceptual and Motor Development in Infants and Children. The Macmillan Company, 866 Third Avenue, New York, New York, 1970, pp. 247-271.

37. Cratty, Bryant J. Active Learning. Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1971.

38. Cratty, Bryant J. Teaching Motor Skills. Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1973.

39. Cruickshank. William M., Bentzen, Frances A., Ratzeburg, Fredrick H. and Tannhauser, Mirian T. "A Teaching Method for Brain-Injured and Hyperactive Children," pp. 4, 5, 6, 7, 137, 269, 272.

40. Cumbee, F. Z. "A Factorial Analysis of Motor Coordination," Research Quarterly. 25:1954, pp. 412-428.

BEST COPY AVAILABLE

41. Cumbee, F. Z., Meyer, Margaret, and Peterson, G. "Factorial Analysis of Motor Coordination Variables for Third and Fourth Grade Girls," Research Quarterly, 28:1957, pp. 100-108.

42. Dayton Public Schools -- Pertinant Research (unpublished).

43. Delacato, Carl H. The Diagnosis and Treatment of Speech and Reading Problems. Charles C. Thomas, Springfield, Illinois, 1963.

44. Delacato, Carl H. The Elementary School of the Future. Thomas Books, Springfield, Illinois, 1965.

45. Dubnoff, Belle. "Early Detection and Remediation of Learning Disabilities," Dubnoff School of Educational Therapy, 10526 Victory Place, North Hollywood, California 91606, 1970.

46. Dunn, J. A. "Inter- and Intra-rater Reliability of the New Goodenough-Harris Draw-a-Man Test," Perceptual and Motor Skills. 24:1967, pp. 269-270.

47. Dunsing, J. D. and Kephart, N. C. "Motor Generalizations in Space and Time," Learning Disorders. 1:Seattle: Special Child Publications, 1965, p. 77.

48. Early, George H. Perceptual Training in the Classroom. Charles E. Merrill Publishing Company, Columbus, Ohio, 1973.

49. Ebersole, James G., Ebersole, Mary Lou, and Kephart, Newell C. Steps to Achievement for the Slow Learner. Charles E. Merrill Publishing Company, Columbus, Ohio, 1968, pp. 2, 16, 19, 24.

50. Espenshuck, Anna S. and Eckert, Helen M. Motor Development. Charles E. Merrill Books, Inc., Columbus, Ohio, 1967, pp. 105, 108, 111, 117, 122, 126, 165.

51. Fink, Max, Green, Martin, and Bender, Morris. "Perception of Simultaneous Tactile Stimuli by Mentally Defective Subjects," Journal of Nervous and Mental Disease. 117:1953, pp. 43-49.

52. Frostig, M. "Visual Perception in the Brain-Injured Child," American Journal of Orthopsychiatry. 33:1963, pp. 665-671.

53. Frostig, M., Maslow, P., Lefever, W., and Whittlesey, J. R. B. "The Marianne Frostig Developmental Test of Visual Perception," Perceptual and Motor Skills, 19:1965, pp. 464-499.

54. Frostig, Marianne and Horne, David. "An Approach to the Treatment of Children with Learning Disroders," Learning Disorders. 1:Seattle: Special Child Publications, 1965, p. 293.

BEST COPY AVAILABLE

55. Gesell, Arnold and Amatruda, Catherine. Developmental Diagnosis. Paul B. Hoeber Incorporated, New York-London, 1947.

56. Gesell, Arnold. "The Development of Handedness," Journal of Genetic Psychology. 70:1947, pp. 155-175.

57. Gardner, Elizabeth B. "The Neuromuscular Base of Human Movement," Journal of Health Physical Education, and Recreation. 36:October 1965, p. 61.

58. Godfrey, Barbara G. and Kephart, Newell. Movement Patterns and Motor Education. Meredity Corporation, 1969, pp. 6-17.

59. Haring, Norris G. and Stables, Jeanne Marie. "Visual Perception and Eye-Hand Coordination," Physical Therapy. 46:1966, pp. 129-135.

60. Haring, Norris B. and Ridgeway, Robert W. "Early Identification of Children With Learning Disabilities," Exceptional Children. 33:1967, pp. 387-395.

61. Harrow, Anita J. A Taxonomy of the Psychomotor Domain. David McKay Company, Inc., New York, 1972.

62. Hildreth, Gertrude. "The Development and Training of Hand Dominance: III. Origins of Handedness and Lateral Dominance," Journal of Genetic Psychology. 76:1950, pp. 255-275.

63. Hildreth, Gertrude. "The Development and Training of Hand Dominance: IV. Development Problems Associated with Handedness," Journal of Genetic Psychology. 75:1949, pp. 92, 96, 97.

64. Hoop, Nancy Hulbert. "Part I: Object Recognition, Haptic Perception in Pres ool Children," The American Journal of Occupational Therapy. 25:(7), October 1971, pp. 340-344.

65. Hoop, Nancy Hulbert. "Part II: Object Manipulation, Haptic Perceptions in Preschool Children," The American Journal of Occupational Therapy. 25:(3), November-December 1971, pp. 415-419.

66. Keogh, Barbara and Keogh, Jack. "Pattern Copying and Pattern Walking Performance of Normal and Educationally Subnormal Boys," American Journal of Mental Deficiency. 71:1967, pp. 1009-1013.

67. Keogh, Barbara K. and Smith, Carol E. "Change in Copying Ability of Young Children," Perceptual and Motor Skills. 26:(3), 1968, pp. 773-774.

68. Keogh, Barbara K. "Preschool Children: Performance on Measures of Spacial Organization, Lateral Preference, and Lateral Usage," Perceptual and Motor Skills. 34:(1), February 1972, pp. 299-302.

BEST COPY AVAILABLE

69. Kephart, Newell C. "Perceptual Motor Performance," Journal of Health, Physical Education, and Recreation. 37:pp. 28-29.

70. Kershner, Keith M. and Dusewicz, Russel A. "K.O.K. -- Oseretzky Tests of Motor Development," Perceptual and Motor Skills. 30:February 1970, p. 202.

71. Kinsbourne, M. and Warrington, Elizabeth K. "The Developmental Gerstman Syndrome," Archives of Neurology. 8:May 1963, p. 490.

72. Knickerbocker, Major, Barbara M. "Gaining a Perspective: The Overall Field, Occupational Therapy and the Therapist," as cited in Perceptual-Motor Dysfunction, Evaluation and Training, Occupational Therapy Seminar, Madison, Wisconsin, June 1966, pp. 5, 6, 7, 9.

73. Knickerbocker, Barbara M. "Programming Units Related to the Five Syndromes of Perceptual-Motor Dysfunction," as cited in Perceptual-Motor Dysfunction Evaluation and Training, Occupational Therapy Seminar, Madison, Wisconsin, June 1966, p. 73.

74. Koppitz, Elizabeth. "Relationships Between the Bender Gestalt Test and the Wechsler Intelligence Test for Children," Journal of Clinical Psychology. 14:1958, pp. 413-416.

75. Koppitz, Elizabeth M., Sullivan, John, Blyth, David D., and Shelton, Joel. "Prediction of First Grade Achievement with the Bender Gestalt Test and Human Figure Drawings," Journal of Clinical Psychology. 15:1959, pp. 164-168.

76. Krippner, S. "Evaluating Pre-Readiness Approaches of Reading," Education. 87:September 1966, p. 16.

77. Latchaw, Marjorie. "Measuring Selected Motor Skills in Fourth, Fifth, and Sixth Grades," Research Quarterly. 25:1954, pp. 439-449.

78. Maloney, Michael P., Ball, Thomas S., and Edgar, Clara L. "Analysis of the Generalizability of Sensory-Motor Training," American Journal of Mental Deficiency. 74:January 1970, p. 458.

79. Maslow, Phyllis, Frostig, Marianne, Lefever, D. W., and Whittlesay, R. J. "The Marianne Frostig Developmental Test of Visual Perception," Perceptual and Motor Skills. 19:October 1964, pp. 463-499.

80. Morris, P. R. and Whiting, H. T. Motor Impairment and Compensatory Education. Lea and Febiger, Philadelphia, 1971.

BEST COPY AVAILABLE

81. Penman, Kenneth A. "A New Dynamic Testing Device: The Dynabalometor," Perceptual and Motor Skills. 23:1966, pp. 232-234.

82. Piaget, Jean. The Child's Conception of Space. Routledge and Kegan Paul, London, 1956.

83. Pikler, Emmi. "Some Contributions to the Study of the Gross Motor Development of Children," Journal of Genetic Psychology. 113: 1968, pp. 27-39.

84. Rarick, G. L. and McKee, R. "A Study of Twenty Third Grade Children Exhibiting Extreme Levels of Achievements on Tests of Motor Proficiency," Research Quarterly. 201:1949, pp. 142-150.

85. Roach, Eugene G. and Kephart, Newell C. The Purdue Perceptual Motor Survey, Charles E. Merrill Publishing Company, Columbus, Ohio, 1966.

86. Sapir, Selma. "Sex Differences in Perceptual Motor Development," Perceptual and Motor Skills. 22:1966, pp. 987-992.

87. Sedgwick, Robert P. "The Examinations of Higher Cerebral Functions in Children," Learning Disorders. 3:Seattle: Special Child Publications, 1965, p. 15.

88. Seils, Leroy G. "The Relationship Between Measures of Physical Growth and Gross Motor Performance of Primary Grade School Children," Research Quarterly. 22:1951, pp. 244-260.

89. Seymour, Lesser. "Integrating Knowledge in Optometric Diagnosis and Treatment of Children with Learning Disabilities," as cited in Perceptual-Motor Dysfunction, Evaluation and Training, Occupational Therapy Seminar, Madison, Wisconsin, June 1966, p. 17.

90. Silverstein, A. B. "Variance Components in Frostig Developmental Test of Visual Perception," Perceptual and Motor Skills, 20:1965, pp. 973-976.

91. Smart, Mollie S. and Smart, Russel C. Children, Development and Relationships. The Macmillan Company, New York, 1967.

92. Smith, Hope M. "Motor Activity and Perceptual Development," 39: February 1968, pp. 28-36.

93. Smith, Laura K. "Reflex Inhibiting Postures and Equilibratory Reactions in the Treatment of Cerebral Palsy," as cited from Bobath.

94. Steinhaus, Arthur H. "Your Muscles See More Than Your Eyes," Journal of Health, Physical Education and Recreation. 37:September 1966 p. 38.

BEST COPY AVAILABLE

95. Swanson, Robert. "Perception of Simultaneous Tactical Stimulation in Defective and Normal Children," American Journal of Mental Deficiency. 61:1957, pp. 743-755.

96. Thomas, Jenny R., Chissom, Brad S., and Biasotto, Judson. "Investigation of the Shape-O-Ball Test as a Perceptual-Motor Task for Preschoolers," Perceptual and Motor Skills. 35:(2), 1972, pp. 447-450.

97. Travers, Robert M. W. "Perceptual Learning," Review of Educational Research. 37:(5), December 1967, pp. 559-617.

98. Trussell, Ella. "Relation of Performance of Selected Physical Skills to Perceptual Aspects of Reading Readiness in Elementary School Children," Research Quarterly. 40:(21), 1967, pp. 383-390.

99. Vane, Julia R. and Kessler, Rosalyn T. "The Goodenough Draw-A-Man Test: Long Term Reliability and Validity," Journal of Clinical Psychology. 20:1964, pp. 487-488.

100. Vane, Julia R. "An Evaluation of the Harris Revision of the Goodenough Draw-A-Man Test," Journal of Clinical Psychology. 23:1967, pp. 375-377.

101. Wedell, K. and Horne, Edna I. "Some Aspects of Perceptuo-Motor Disability in 5½ Year-Old Children," British Journal of Educational Psychology. 39:June 1969, p. 72.

102. Whipple, Clifford I. and Maier, Louise J. "Perceptual-Motor Maturation and Language Development in Young Children," Perceptual and Motor Skills. 23:1966, p. 1208.

103. Whittle, H. D. "Effects of Elementary School Physical Education Upon Aspects of Physical, Motor, and Personality Development," Research Quarterly. 32:1961, pp. 249-260.

104. Wilbarger, Patricia. "Application of Treatment Principles," as cited in Perceptual Motor Dysfunction, Evaluation and Training, Occupational Therapy Seminar, Madison, Wisconsin, June 1966, p. 109.